

Quectel LPWA Module BG96

Product Overview

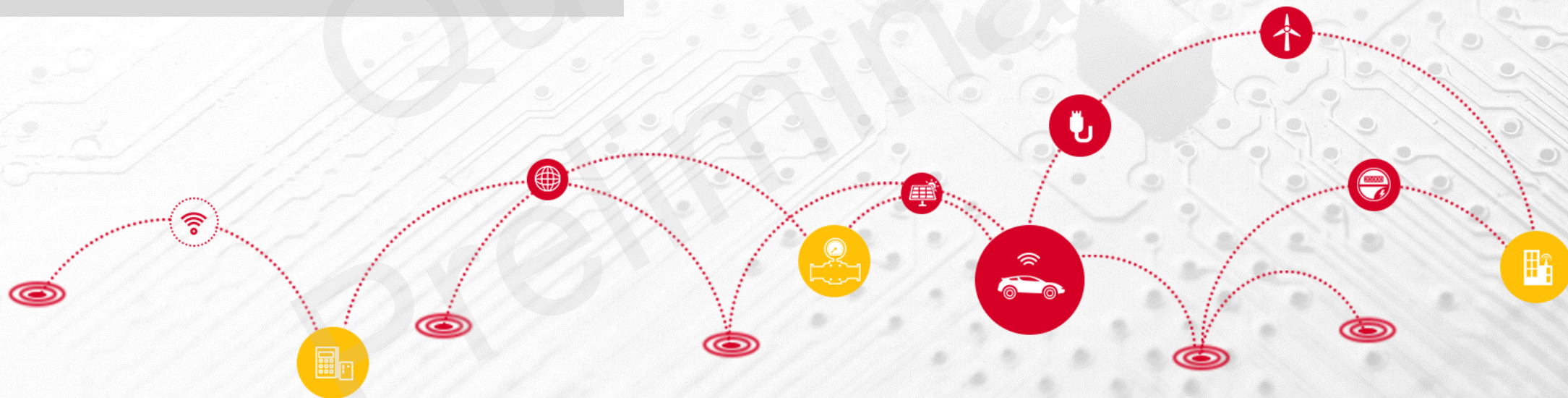
August, 2017

Technical Background

Product Overview

Technical Details

Applications

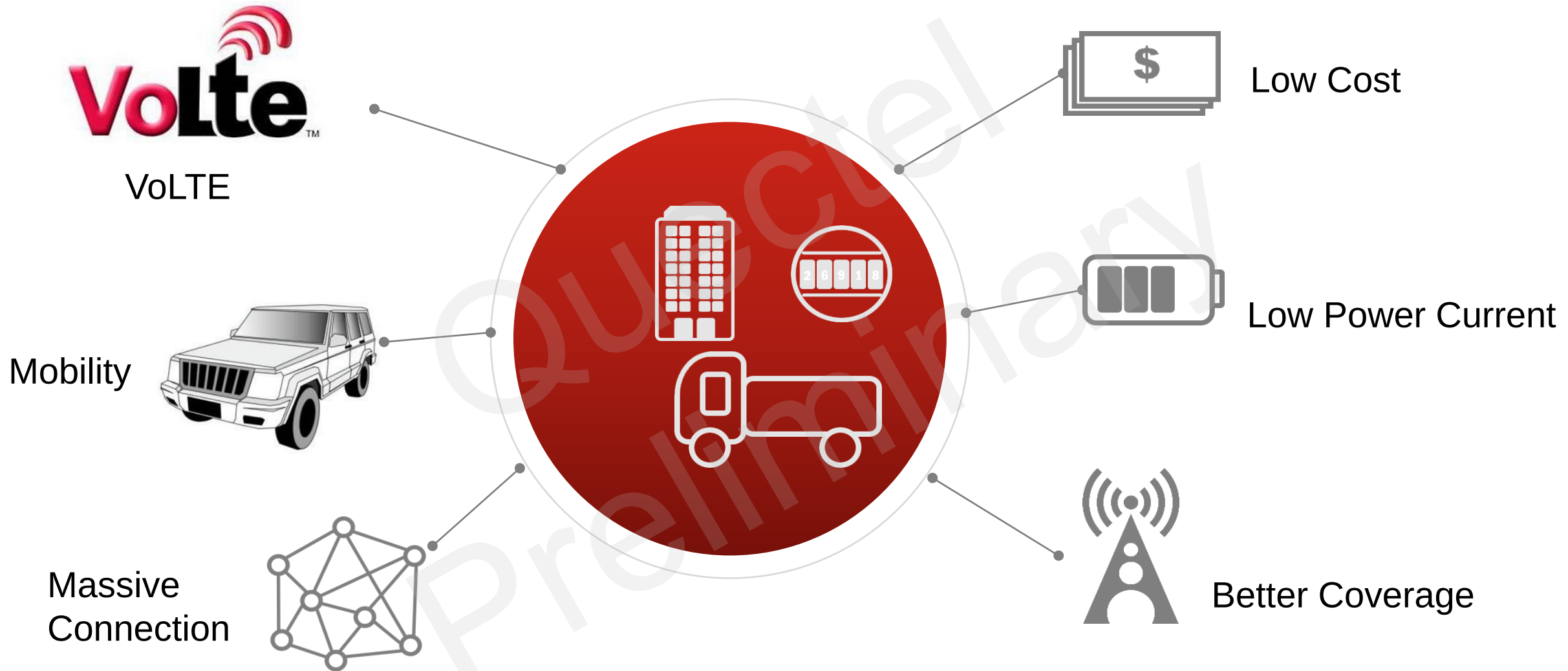


eMTC Evolution

	Rel-8 Cat.4	Rel-11 Cat.1	Rel-13 Cat.M1	Rel-13 NB-IoT
Downlink Peak Rate	150Mbps	10Mbps	1Mbps	<100Kbps
Uplink Peak Rate	50Mbps	5Mbps	1Mbps (Full Dup.)	<100Kbps
Coverage MCL (Minimum Coupling Loss)	140.7dB	140.7dB	155.7dB	164dB
Battery Life (200 bytes/day)	<1 year	<1 year	~10 years	~10 years
Number of Antennas	2	2	1	1
UE Receive Bandwidth	20MHz	20MHz	1.4MHz	200KHz
UE Transmit Power	23dBm	23dBm	23dBm	23dBm
Standard Readiness	Now	Now	Mar. 11, 2016	Jun. 9, 2017
Network Readiness	Now	Now	Q3 2017	Q3 2017

eMTC: Enhanced Machine Type Communication

eMTC Advantages

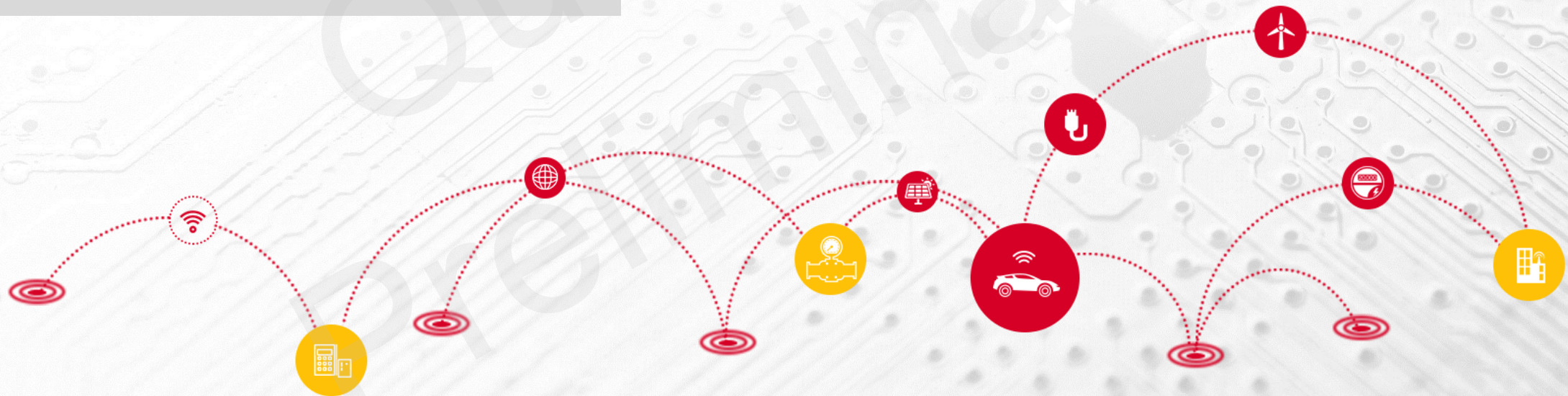


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BG96 Highlights

1

Multi Modes: Cat.M1, Cat.NB1, EGPRS

2

Global Bands:

Cat.M1/NB1: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28/B39 (*B39 for Cat.M1 only*)

EGPRS: 850/900/1800/1900MHz

3

Low Power Consumption: Approx. 10uA in PSM mode

4

Mobility: Movable application

5

GNSS: GPS, GLONASS, BeiDou/Compass, Galileo, QZSS

6

VoLTE: PCM digital audio interface

BG96 Specifications 1

Cat.M1/Cat.NB1/EGPRS

Package: 102-pin LGA

Data Rate:

- LTE Cat.M1: Max. 375kbps (DL), Max. 375kbps (UL) (Half Duplexer)
- LTE Cat.NB1: Max. 32kbps (DL), Max. 70kbps (UL)
- GPRS: Max. 107kbps (DL), Max. 85.6kbps (UL)
- EGPRS: Max. 296kbps (DL), Max. 236.8kbps(UL)

Protocols: PPP/TCP/UDP/SSL/TLS/FTP(S)/HTTP(S)

Functions: Data/VoLTE/GNSS/FOTA

Interfaces: (U)SIM/UART/USB/I2C/PCM/ADC/GPIO/Antenna

Power Consumption (Typical):

LTE Cat.M1 Mode:

- PSM mode: 10.4uA
- Standby State: 1.99mA @DRX=1.28s
- LTE Connected Mode:
 - 124mA @0dBm
 - 136mA @12dBm
 - 190mA @23dBm

LTE Cat.NB1 Mode:

- Power Saving Mode: 9.8uA
- Standby State: 2.77mA @eDRX=2.48s
- LTE Connected Mode: TBD



BG96 Specifications 2



22.5mm × 26.5mm × 2.3mm
LTE Cat.M1/NB1/EGPRS

■ LPWA Cat.M1/Cat.NB1/EGPRS Module

Items	BG96	BG96-NA
Cat.M1	LTE FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28 LTE-TDD: B39	B2/B4/B12/B13
Cat.NB1	LTE FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28	B2/B4/B12/B13
EGPRS	850/900/1800/1900MHz	/
GNSS	Optional ^{NOTE}	Optional ^{NOTE}
Region	Global	North America
Certification	FCC (Completed)/ CE*/ GCF*/ PTCRB*/ Verizon*/ AT&T*/ Telstra*/ BELL*/ RCM*/ IC*	FCC (Completed)/ Verizon*

NOTE: GNSS function is not included by default. If needed, a different OC will be provided.

“” means the certificate is ongoing.*

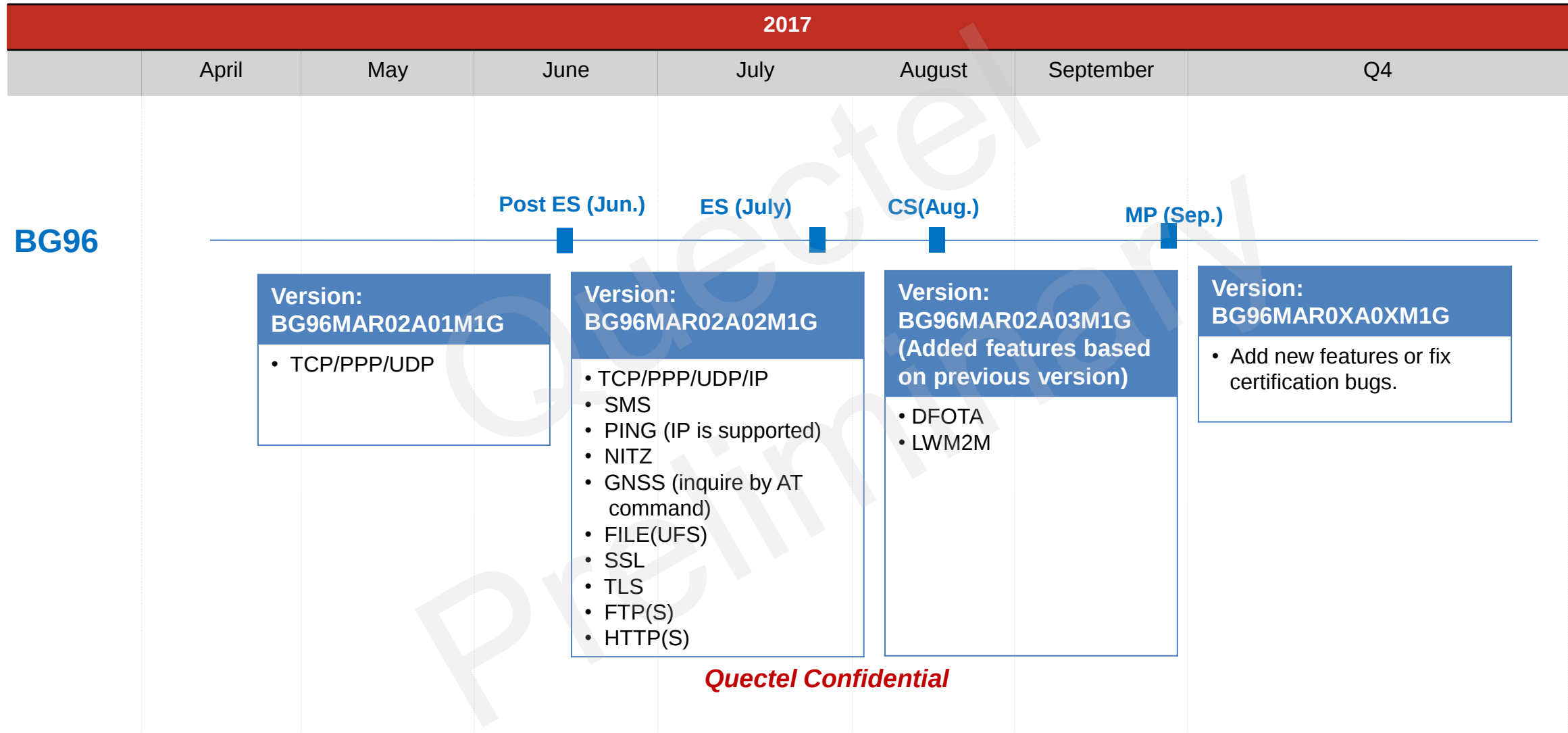
BG96 Main Interfaces

Interface	BG96/BG96-NA
(U)SIM	1.8V/3.0V
UART	3 (UART1, UART2, UART3)
USB	1
I2C	1
ADC	2
GPIO	2 (I2C and UART3 can be re-configured as extra 4 GPIOs if they are not used)
PCM	1
Antenna pad	2 (for Main Antenna and GNSS Antenna, respectively)
GNSS (Optional)	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS

BG96 Main Functions

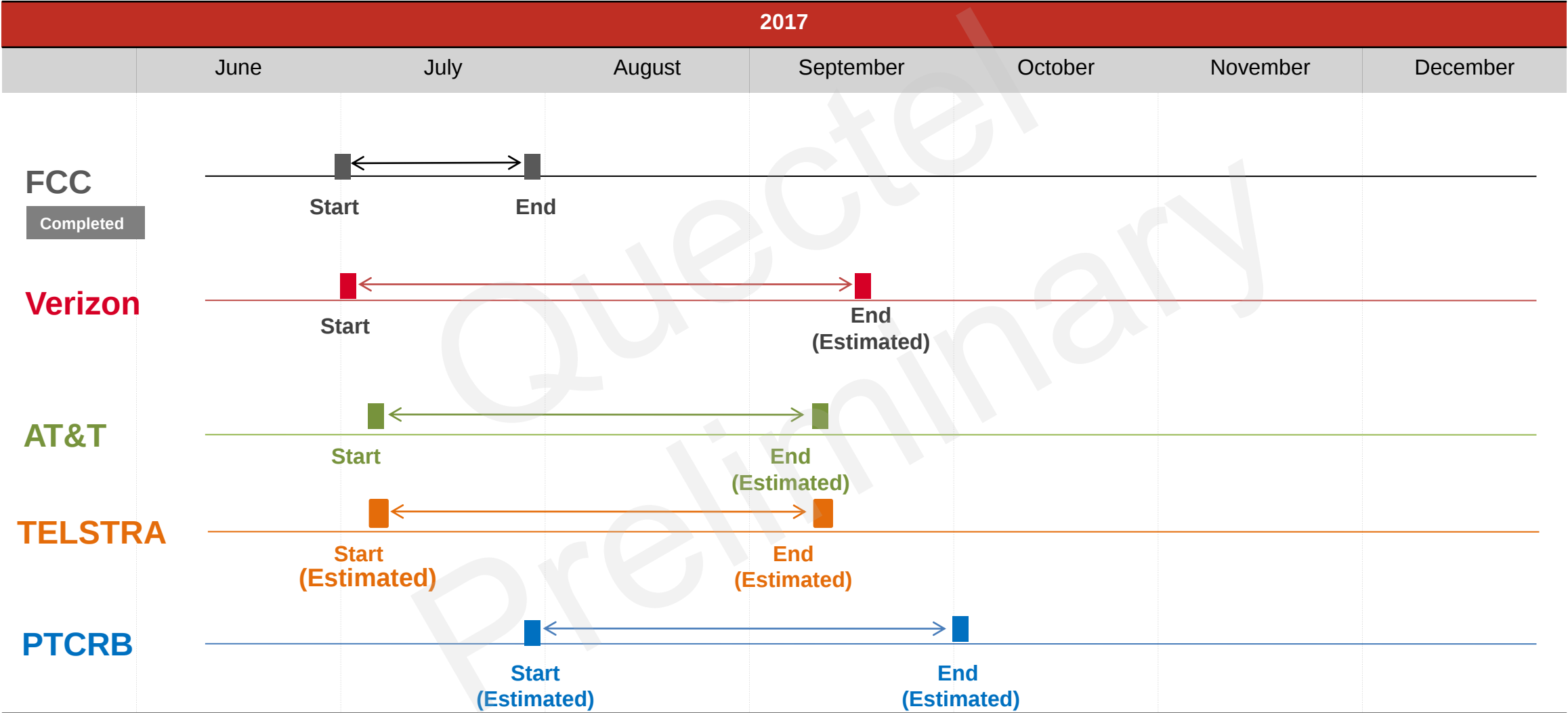
Function	BG96/BG96-NA
Protocols	PPP/TCP/UDP/SSL/TLS/FTP(S)/HTTP(S)
RIL Driver	Android 4.x/5.x/6.0
USB Serial Driver	Windows XP, Windows Vista, Windows 7/8/8.1/10, Windows CE 5.0/6.0/7.0, Linux 2.6/3.x/4.1, Android 4.x/5.x/6.0
NDIS Driver	Windows 7/8/8.1/10
Gobinet Driver	Linux 2.6/3.x/4.1
QMI_WWAN Driver	Linux 3.x (3.4 or later)/4.1
SMS	Point-to-point MO and MT; SMS Cell Broadcast; Text and PDU Mode
Voice	VoLTE (for Cat.M1 only. Support Realtek ALC 5616 codec by default firmware)
DFOTA	Delta firmware upgrade over the air
LWM2M	In progress

BG96 Timeline



NOTE: The firmware plan for BG96-NA is similar to that for BG96.

BG96 Certification Test Plan



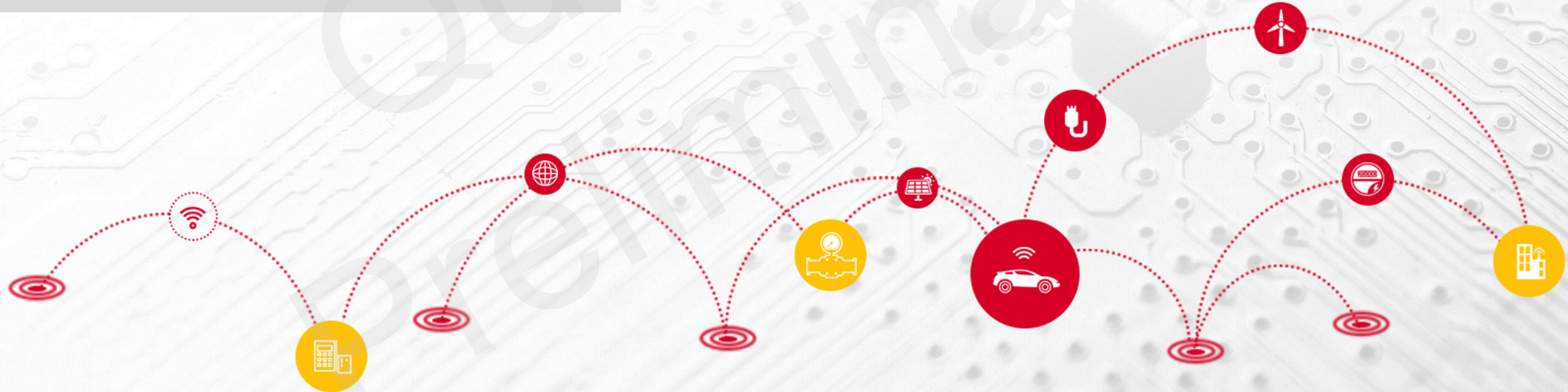
NOTE: PTCRB test case for LTE Cat.M1 is not ready.

Technical Background

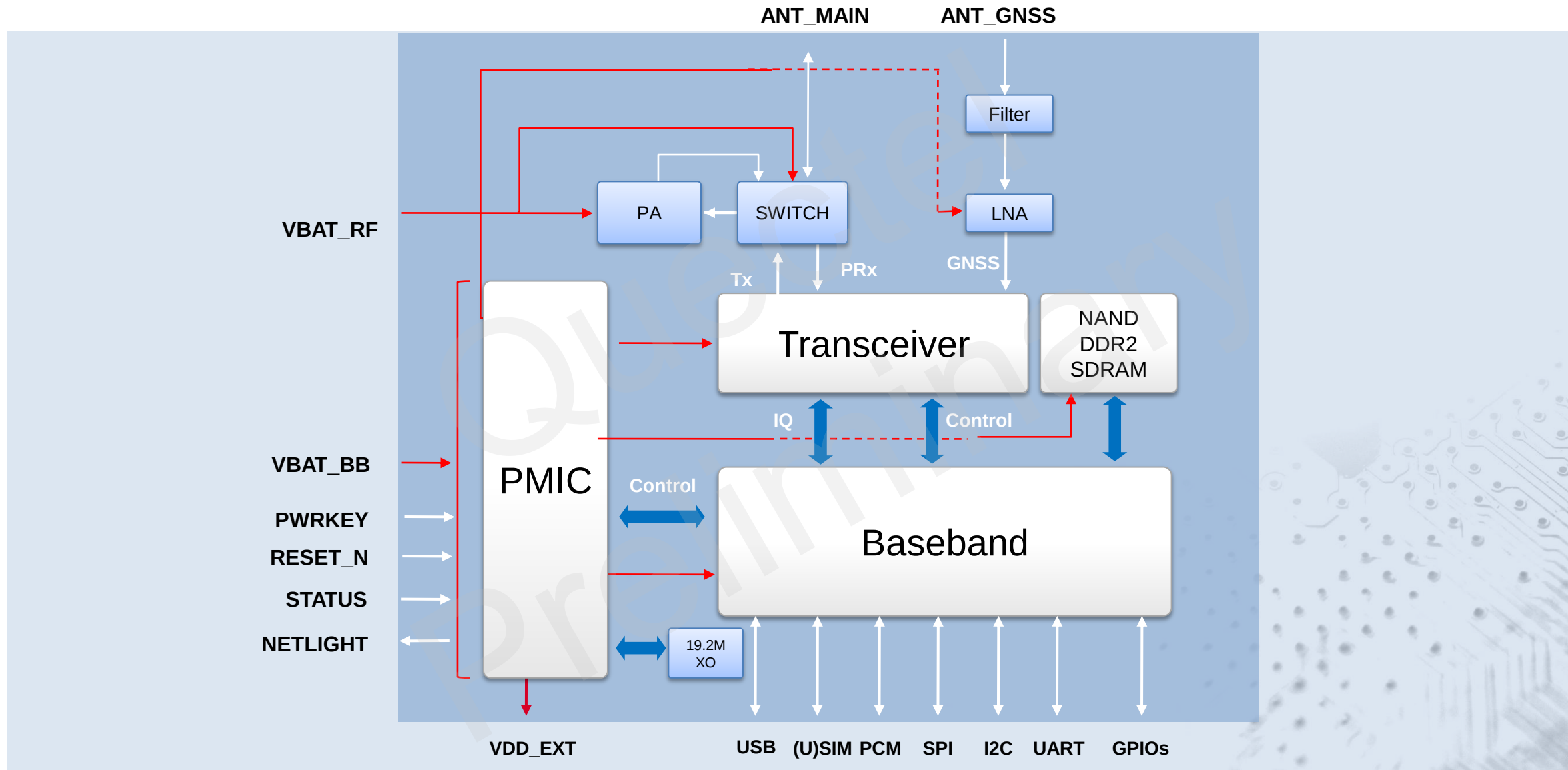
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Technical Details

Applications



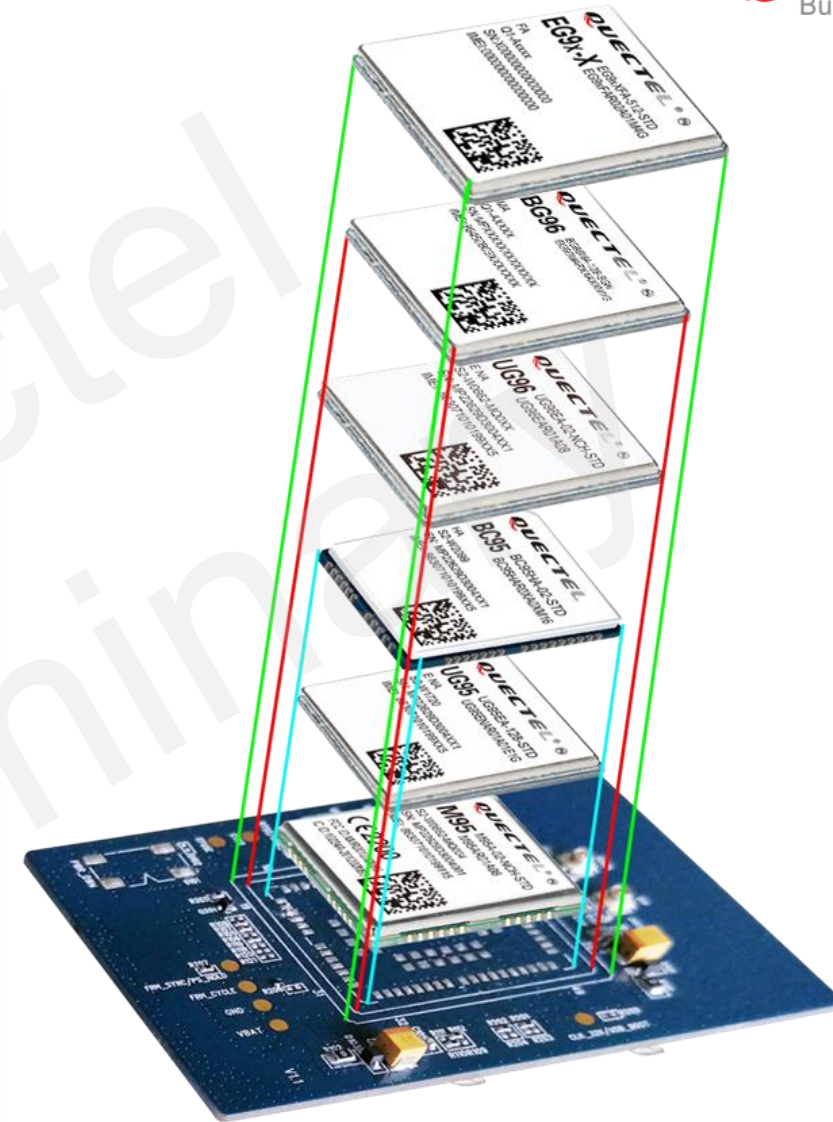
Hardware Architecture



Layout Compatibility

BG96 is compatible with the following Quectel modules:

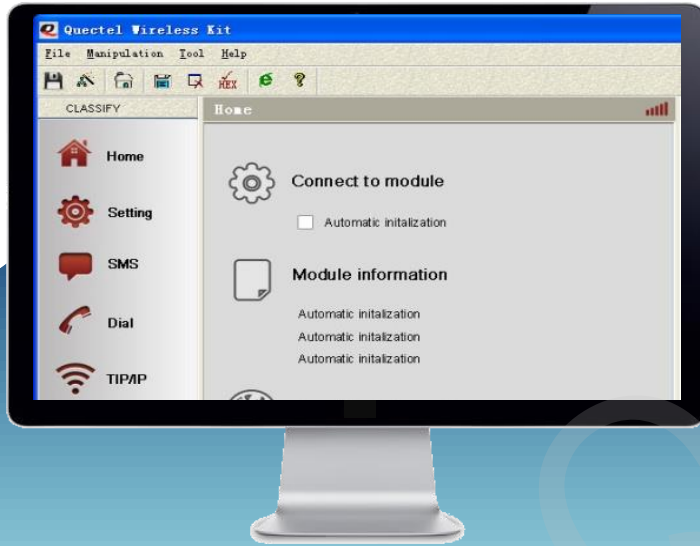
- GSM/GPRS module M95
- UMTS/HSPA modules UG96 & UG95
- LTE Cat.4/Cat.1 module EG95/EG91
- LTE Cat.NB1 module BC95



NOTE: The compatibility diagram shown above is for illustration purpose only. The actual appearance of the modules may be different.

Quick Start

UMTS & LTE EVB Kit



Quectel offers a GUI tool named **QNavigator**. It can help customers quickly test Quectel module's functionality.

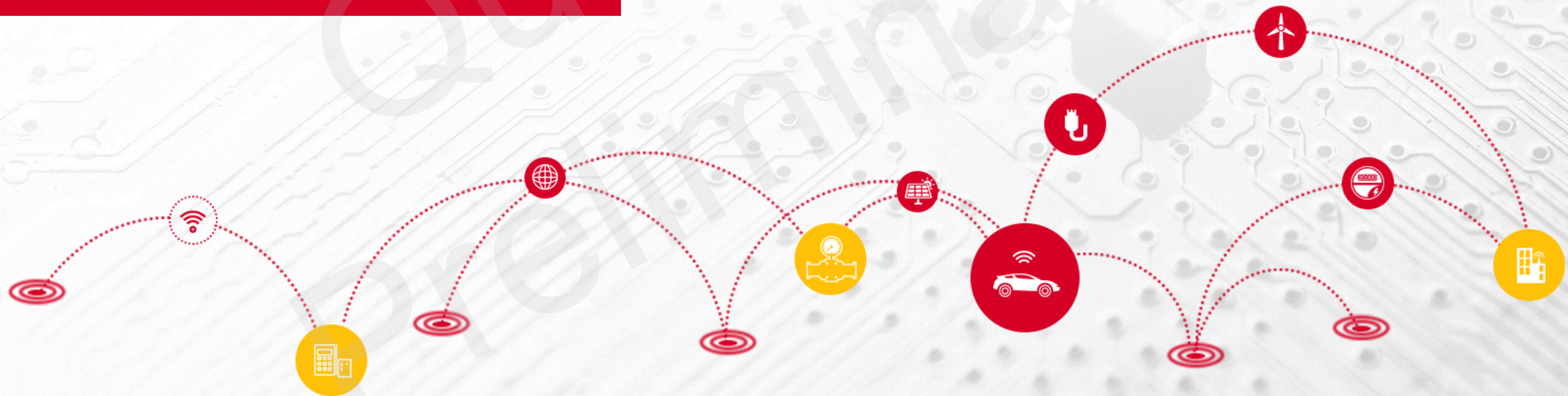


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eMTC Application Markets

Industry & Agriculture

- Gas Detector
- Soil PH Tester
- Optical Sensor
- Machinery Alarm System
- Irrigation Controller
- Elevator

Daily Life

- Asset Tracking
- Electronics
- Person/Pet Tracking

Public Utilities

- Water/Gas Metering
- Smart Parking System
- Fire Hydrant
- Smoke Alarm
- Trash Bin
- Street Lighting

eMTC



eMTC Applications in Elevators

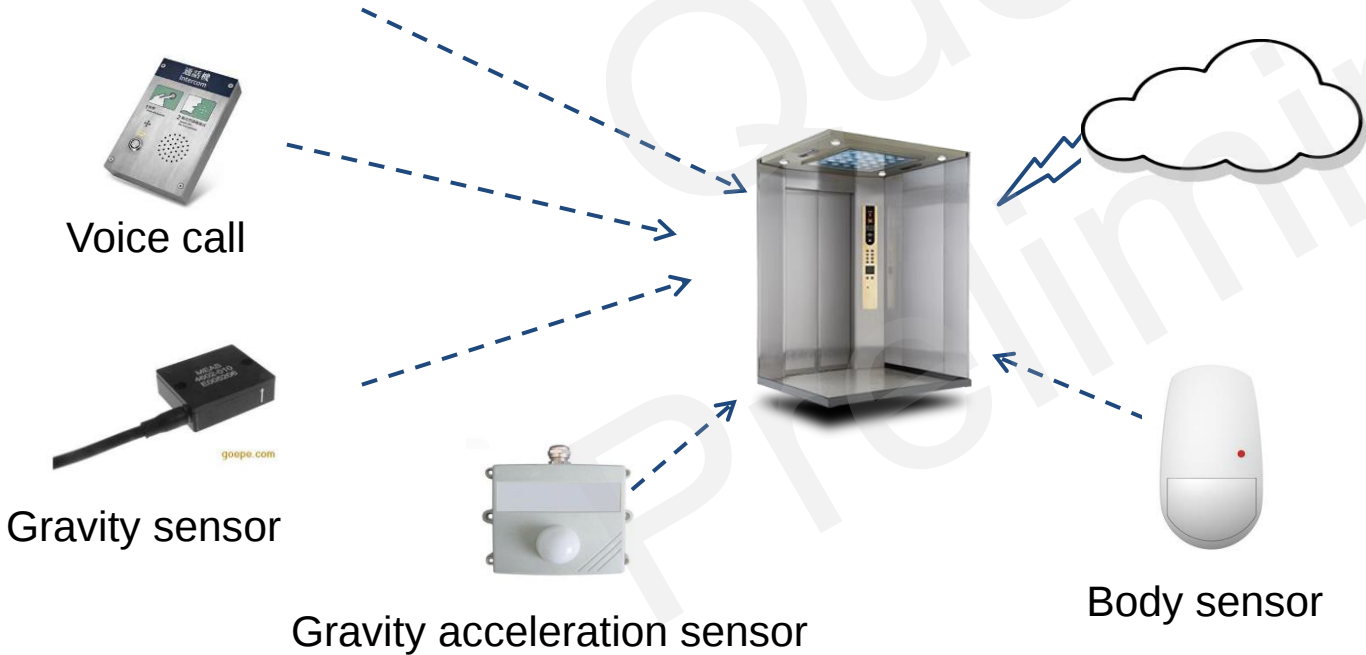


Fingerprint authentication



BG96 Characteristics

- Mobility
- VoLTE
- Better coverage



Elevator Management System

- Emergency call
- Malfunction alert and diagnosis
- Daily maintenance
- Life-cycle management

LPWA Network Deployments

Over 25 mobile operators committed to deploy Cat.M1 and/or Cat.NB1 networks

Verizon/ AT&T/ TELUS (Cat.M1)
Sprint (Cat.M1 + Cat.NB1)

KPN/ Orange (Cat.M1)
Vodafone/ T-Mobile/ MegaFon/ Turkcell/ Etisalat (Cat.NB1)
Telefonica/ Telia (Cat.M1 + Cat.NB1)

Telefonica/ Vivo (Cat.NB1)

■ Cat.NB1

■ Cat.M1

■ Cat.M1 + Cat.NB1

MTN (Cat.NB1)

SKT (Cat.M1)
CMCC / CTCC / CUCC / KT / LGU+ / M1 (Cat.NB1)
NTT Docomo / SoftBank/ KDDI (Cat.M1 + Cat.NB1)

Telstra (Cat.M1)
Vodafone (Cat.NB1)

Thank you!

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